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Case report

Neurological recovery at age 92 after acute trauma and operative spinal decompression

Hazem Eltahawy, MD, PhD, FRCS, FACS, Angela Ransom, NP, Gary Rajah, MD *

Department of Neurosurgery, Wayne State University School of Medicine, 4201 Saint Antoine Suite 6E, Detroit, MI, USA

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ABSTRACT

People aged > 80 years are among the fastest growing segments of most Western societies. With improved lifestyles and medical care, complex surgical interventions will be increasingly offered to elderly patients. Questions will arise about the value of performing major surgery in patients near their postulated end of life. Here, we describe a near-full neurological recovery from a profound neurological deficit that occurred as a result of a spinal fracture after a fall. To our knowledge, this is the first report of neurological recovery at such an advanced age.

1. Introduction

People aged > 80 years are among the fastest growing segments of most Western societies. With improved lifestyles and medical care, complex surgical interventions will be increasingly offered to elderly patients. Questions will arise about the value of performing major surgery in patients near their postulated end of life.

2. Case Report

The patient is a 92-year-old fairly independent female with coronary artery disease, diabetes mellitus, osteoporosis, and cervicothoracic kyphosis, who became acutely, densely paraparetic after a fall. She complained of severe upper thoracic pain, and became incontinent of bowel and bladder. Her visual analog score (measure of pain: 1 = low, 10 = high) ranged from 5 to 7 despite intravenous and oral narcotics. An examination displayed that her lower-extremity motor strength was 2/5 (3/5 is antigravity according to the Medical Research Council scale) in hip flexors, 2+ in knee extensors, 1+ in dorsiflexion, and 2+ in plantar flexion. Sensations were diminished below thoracic (T) 5 level. Plantar reflexes were equivocal. Her American Spinal Injury Association[1] score was B. The magnetic resonance imaging of the thoracic spine revealed a T5 burst fracture with posterior retropulsion into the canal, causing spinal-cord compression (Figure 1). Neurosurgery was consulted at this time once imaging was obtained 3 days after admission.

Early surgical decompression and stabilization of the spine were discussed with the patient and her family. Despite no guarantee of the return of function, and the significant perioperative risks due to her advanced age and medical comorbidities, the patient was adamant that she would not want to remain in her current condition and accepted the risks of surgery. The patient was on aspirin and Plavix that were stopped after admission.

The procedure was performed 6 days after stopping aspirin and clopidogrel to give time for platelet function to recover and reduce the risk of bleeding. Surgery entailed minimally invasive lateral extracavitary T5 corpectomy and spinal-cord decompression, with acrylic anterior-column reconstruction and T3–T7 posterolateral instrumented fusion (Figure 2). Paramedian fascial incisions and unilateral exposure of the rib was carried out. Excision of the rib and transverse process was followed by exposure of the fractured T5 vertebra. The screws were inserted after injection of the pilot holes with acrylic to strengthen the bone–screw interface. The length of surgery was 5 hours and 54 minutes, and the estimated blood loss was 870 cc.

The immediate postoperative course was complicated by heart failure that resolved medically. She was transferred to a

* Corresponding author. Department of Neurosurgery, Wayne State University School of Medicine, 4201 Saint Antoine Suite 6E, Detroit, MI 48201, USA.
E-mail address: grajah@med.wayne.edu (G. Rajah).

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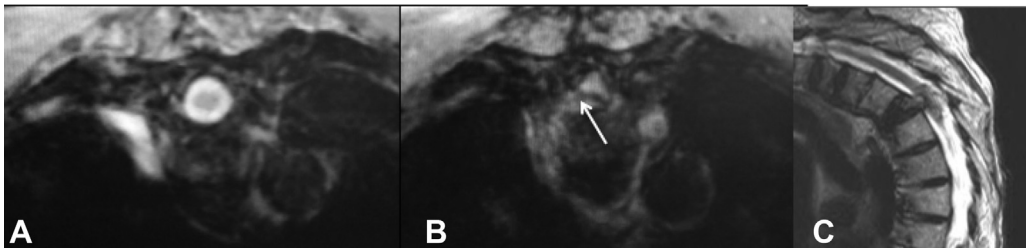

Figure 1. Axial T2 images: (A) at level T4 and (B) at level T5 with arrow pointing to retropulsed fragment. (C) Thoracic spine magnetic resonance imaging T2 sagittal sequence shows wedge fracture of the T5 vertebral body with retropulsed fragment causing spinal-cord compression. T = thoracic.

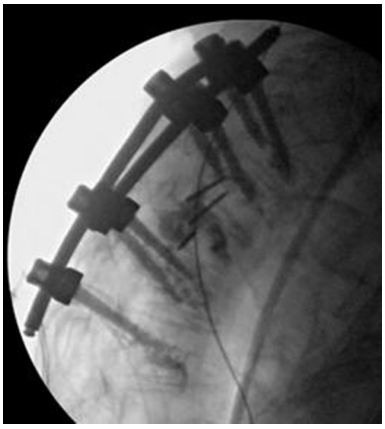

Figure 2. Intraoperative X-ray showing the instrumentation and T5 vertebral reconstruction with cement after corpectomy. T = thoracic.

rehabilitation facility after 12 days, where she showed steady neurological improvement, regaining lower-extremity motor strength to 4/5, and controlling her bowel and bladder. At 12 months after injury, she was able to walk freely with a walker, mainly to avoid further falls, and has no pain. Her postoperative American Spinal Injury Association score was D using a visual analog score of 2. At 24 months, she was healed as evidenced by stable neurological function, absence of pain, and stable construct on chest X-ray.

3. Discussion

There is a general reluctance to offer extensive surgical measures at the extreme end of life, especially in the past[2]; this also applies to the clinical setting of a traumatic spinal-cord injury. Neurosurgical procedures according to one study carried more than three times the 30-day mortality for those aged > 80 years compared with those aged < 80 years.[2] Adding to this reluctance to perform spinal surgery, in particular after a severe deficit, is the general perception that spinal-cord injuries (especially in the elderly) are irreversible, and proposing surgical treatment is futile. According to one study, knowledge of spinal-cord injury among primary-care physicians is limited, owing to low case volumes.[3] Thus, misconceptions can arise. In an environment of escalating health costs, focus on cost containment has been directed to the last year of life, where almost 25% of all expenses are typically incurred.[4] The case we present provides clinical evidence of the possibility of neurological recovery from severe spinal-cord dysfunction in a patient aged > 90 years of age. The main factors that led to this outcome in our patient are: (1) a high preinjury performance; (2) absence of dementia; and (3) timely, relatively uncomplicated, operative intervention.

Spinal-cord injury is devastating due to loss of ambulation and independence. Mortality after a spinal fracture is increased in patients,[5,6] especially if associated with neurological injury.[7] Furthermore, elderly patients aged > 65 years with cervical spinal injury and neurological deficits have been seen with significantly higher mortality rates when treated nonoperatively.[8]

Among patients who survived their initial injury, older age was not found to significantly alter the motor or sensorimotor recovery,[9] or impact the spinal-cord histological tissue changes in postmortem examination of spinal-cord-injury patients.[10] It is well known that timely surgical stabilization of fracture in the elderly reduces morbidity and mortality; this is best documented in the orthopedic literature of neck fracture or of the femur.[11] However, perioperative mortality is significantly increased in those patients with hip fracture aged > 85 years of age.[12] Type II odontoid-fracture operative fixation in the elderly has a hazard ratio of 0.4, 0.8, and 1.9 for ages 65–74 years, 75–84 years, and > 85 years, respectively.[13] Similarly, a large study (n = 34,000; mean age, 71 years) examining lumbar-spine surgery in Medicare beneficiaries revealed that mortality did not significantly increase until 80–85 years of age, and this increase was associated with decompression and excision procedures, age (in males), and the number of medical comorbidities.[14] One, two, and three comorbidities had a relative risk, compared with zero comorbidities, of 1.79, 4.69, and 10.49, respectively. Therefore, the presence of multiple comorbidities could be more significant than age.

Upon questioning those aged ≥ 75 years, studies found that 32% had fallen in the previous year with 24% of those falls resulting in a serious injury.[15] Other studies have shown falls resulting in an injury may be as high as 59%.[16] Most osteoporotic spinal fractures in the elderly are stable, and are not associated with neurological deficit or require extensive surgery. However, the incidence of more serious, unstable fractures with spinal-cord compression and injury in patients aged > 85 years will likely increase as more baby boomers enter this age group. The management of those injuries as sustained by our 92-year-old patient poses challenging medical questions, and will require decision making that considers the need for more extensive surgical decompression and stabilization.

To date, there is limited evidence available regarding when to offer surgery and to what extent; most of the available evidence does not include patients aged ≥ 80 years. While spinal-cord decompression is generally recommended when an injury results in a compressive bone or disk fragment, the possibility and extent of neurological recovery are unclear when looking at individuals aged > 80 years. Interestingly, several studies have hinted that the elderly may benefit from surgical intervention[17,18]; in addition, a higher level of preoperative function and health has been associated with better postoperative outcomes in the elderly.[19] These

studies, taken together, may provide an adequate rationale for the consideration of operative intervention in high-functioning elderly individuals.

Early decompression appears to provide a significant chance for improvement than other treatments; a recent meta-analysis found improvement levels in patients to be 89.7% higher when treated with early decompression. However, the collection of studies (Classes II, III evidence), as well as other limiting factors, led the analysis only being able to recommend early decompression as a practice option.[20] In terms of cost alone, spine fusion totals, on average, approximately 34,000 USD plus professional fees.[21] However, the 2-year comprehensive cost of caring for 36 Frankel A, B, and C patients was 7.6 million USD.[22] (Frankel A is complete injury, and Frankel C is some preserved motor function below the injury, but it is of no use to the patient.)

When feasible, the operation should be conducted by a surgeon experienced in the complexities of spinal procedures in the elderly. Recent advances in surgery and neuro-anesthesia have made positive outcomes possible, even at the extremities of life.[23] Minimally invasive surgery techniques offer reduced blood loss and tissue disruption, even in complex scoliosis cases.[24] Furthermore, reports of MIS in the elderly have shown low complication rates.[18]

In conclusion, this report identifies an elderly patient with multiple comorbidities who underwent an acute decompression and fusion with near-full neurological recovery from a spinal-cord injury. Whether or not this patient will be representative of most elderly patients remains to be determined; however, it does suggest that acute intervention should be an available option, even in advanced age with the caveat that increasing the comorbidities increases the surgical risk. As always, risk, benefits, and expectations after surgery should be addressed prior to surgery.

Conflicts of interest

All contributing authors declare no conflicts of interest.

References

1. El Masry WS, Tsubo M, Katoh S, El Miligui YH, Khan A. Validation of the American Spinal Injury Association (ASIA) motor score and the National Acute Spinal Cord Injury Study (NASCIS) motor score. *Spine* 1996;**21**:614–9.
2. Hamel MB, Henderson WG, Khuri SF, Daley J. Surgical outcomes for patients aged 80 and older: morbidity and mortality from major noncardiac surgery. *J Am Geriatr Soc* 2005;**53**:424–9.
3. Donnelly C, McColl M, Charlifue S, Glass C, O'Brien P, Savic G, et al. Utilization, access and satisfaction with primary care among people with spinal cord injuries: a comparison of three countries. *Spinal Cord* 2007;**45**:25–36.
4. Hogan C, Lunney J, Gabel J, Lynn J. Medicare beneficiaries' costs of care in the last year of life. *Health Aff (Project Hope)* 2001;**20**:188–95.
5. Center JR, Nguyen TV, Schneider D, Sambrook PN, Eisman JA. Mortality after all major types of osteoporotic fracture in men and women: an observational study. *Lancet* 1999;**353**:878–82.
6. Lau E, Ong K, Kurtz S, Schmier J, Edidin A. Mortality following the diagnosis of a vertebral compression fracture in the Medicare population. *J Bone Joint Surg* 2008;**90**:1479–86.
7. Patel A, Smith H, Radcliff K, Yadlapalli N, Vaccaro A. Odontoid fractures with neurologic deficit have higher mortality and morbidity. *Clin Orthop Relat Res* 2012;**470**:1614–20.
8. Sokolowski MJ, Jackson AP, Haak MH, Meyer Jr PR, Sokolowski MS. Acute outcomes of cervical spine injuries in the elderly: atlantaxial vs subaxial injuries. *J Spinal Cord Med* 2007;**30**:238–42.
9. Furlan JC, Fehlings MG. The impact of age on mortality, impairment, and disability among adults with acute traumatic spinal cord injury. *J Neurotrauma* 2009;**26**:1707–17.
10. Furlan JC, Bracken MB, Fehlings MG. Is age a key determinant of mortality and neurological outcome after acute traumatic spinal cord injury? *Neurobiol Aging* 2010;**31**:434–46.
11. Rogers FB, Shackford SR, Keller MS. Early fixation reduces morbidity and mortality in elderly patients with hip fractures from low-impact falls. *J Trauma Acute Care Surg* 1995;**39**:261–5.
12. Pillai A, Eranki V, Shenoy R, Hadidi M. Age related incidence and early outcomes of hip fractures: a prospective cohort study of 1177 patients. *J Orthop Surg Res* 2011;**6**:5.
13. Chi J. Surgery can protect elderly patients with odontoid fractures: who benefits the most? *Neurosurgery* 2011;**69**:N17.
14. Oldridge NB, Yuan Z, Stoll JE, Rimm AR. Lumbar spine surgery and mortality among Medicare beneficiaries, 1986. *Am J Public Health* 1994;**84**:1292–8.
15. Tinetti ME, Speechley M, Ginter SF. Risk factors for falls among elderly persons living in the community. *N Engl J Med* 1988;**319**:1701–7.
16. Downton JH, Andrews K. Prevalence, characteristics and factors associated with falls among the elderly living at home. *Aging (Milano)* 1991;**3**:219–28.
17. Chibbaro S, Rocco F, Makiese O, Mirone G, Marsella M, Lukaszewicz AC, et al. Neurosurgery and elderly: analysis through the years. *Neurosurg Rev* 2011;**34**:229–34.
18. Rosen DS, O'Toole JE, Eichholz KM, Hrubes M, Huo D, Sandhu FA, et al. Minimally invasive lumbar spinal decompression in the elderly: outcomes of 50 patients aged 75 years and older. *Neurosurgery* 2007;**60**:503–10.
19. Katz J, Stucki G, Lipson S, Fossel A, Grobler L, Weinstein J. Predictors of surgical outcome in degenerative lumbar spinal stenosis. *Spine* 1999;**24**:2229–33.
20. La Rosa G, Conti A, Cardali S, Cacciola F, Tomasello F. Does early decompression improve neurological outcome of spinal cord injured patients? Appraisal of the literature using a meta-analytical approach. *Spinal Cord* 2004;**42**:503–12.
21. Deyo RA, Nachemson A, Mirza SK. Spinal-fusion surgery—the case for restraint. *N Engl J Med* 2004;**350**:722–6.
22. Johnson RL, Brooks CA, Whiteneck GG. Cost of traumatic spinal cord injury in a population-based registry. *Spinal Cord* 1996;**34**:470–80.
23. Apuzzo MLJ. Modernity and the emerging futurism in neurosurgery tempora mutantur nos et mutamur in illis. *J Clin Neurosci* 2000;**7**:85–7.
24. Anand N, Rosemann R, Khalsa B, Baron EM. Mid-term to long-term clinical and functional outcomes of minimally invasive correction and fusion for adults with scoliosis. *Neurosurg Focus* 2010;**28**:E6.